Mini Review

New Approach to In-Service Training of Laboratory Professionals in Sub-Saharan Africa

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A major concern in scaling-up health programs in Sub-Saharan Africa is the lack of quality laboratory services. This is mainly due to the limited availability of well-trained laboratory personnel in both technical and managerial areas. More effective in-service training can be achieved by including on-site and off-site training modules tailored to trainees' specific needs and background. The key step of the proposed approach is an action plan, to be implemented at site level, developed by each trainee during an off-site module. The on-site training module is based on the implementation of the action plan within a specific timeframe that is essential for transferring theoretical knowledge from individuals to practical skills at the laboratory level. Based on the level of implementation of the action plan and completion of objectives, a proficiency training certificate is then awarded. To improve the retention of knowledge among laboratory staff, and hence the quality of laboratory operations, it is crucial that this approach is ingrained into a broader strategy for human resource management at the facility level, including clear job descriptions, salary adjustment policies and professional development strategies.

Key words*: *in-service training, clinical laboratory, professional development, human resource management

Introduction

The burden of HIV/AIDS, malaria, and tuberculosis in many resource-limited countries, particularly those in Sub-Saharan Africa, is immense. Over the past decade, rapid scale-up of health programs to confront these diseases took place on an unprecedented scale. The main achievement of these efforts was broader access to care and treatment services throughout Sub-Saharan Africa. Despite these efforts, many gaps in providing quality services still persist including limited adequately trained healthcare personnel, poor infrastructure in many medical facilities, inadequate or nonfunctional equipment, limited supply chain and supply chain management. These issues need to be addressed in order to ensure the provision of quality services for HIV/AIDS, malaria, and tuberculosis.

More recently, the situation has improved with assistance from various funding streams such as the President's Emergency Plan for AIDS Relief (PEPFAR), which has played a leading role in expanding laboratory services in Sub-Saharan Africa over the past seven years. Launched in 2003, PEPFAR is the largest program initiated by any nation to fight a single disease. In the first five years of the program, PEPFAR established and expanded access to HIV prevention, care and treatment in resource-limited settings. In the following five years, PEPFAR supported countries in taking leadership of the responses to their epidemics and established collaborations with multilateral organizations to expand collective impact. For long-term sustainability, one of the major areas of intervention was to support the training and re-

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tention of different cadres of health care workers. Thus far, more than 140,000 new health care workers were trained in order to strengthen health systems [1]. Clinical laboratory was among the weakest components of the health systems and the latest initiative in response to this deficiency was the recent launch of the African Society for Laboratory Medicine (ASLM) [2].

One major paradigm shift that expanded access to diagnostics was de-centralization of laboratory technology. This shift allowed technology transfer particularly related to HIV disease (including capacity for CD4, viral load and rapid tests) to be widely distributed even in rural point-of-care clinics. De-centralizing these services greatly improved access to care, however issues such as infrastructure, logistics, and supply chain management still persist. Preceding PEPFAR, these issues were widely illustrated [3-5], but the challenges related to human capacity development were reported to be the first barrier for quality improvement at any level of the health care system [6, 7].

The Institute of Human Virology (IHV) of the University of Maryland School of Medicine (UMSOM) as implementing partner of the PEPFAR program spear-headed laboratory system strengthening and local building capacity. Overall, 1484 laboratory technicians/technologists were trained in Ethiopia, Kenya, Nigeria, Rwanda, Tanzania, Uganda, and Zambia over the past 7 years. This long-term commitment allowed the IHV-Global Laboratory Program (GLP) team to gain extensive field experience and expertise in designing and delivering laboratory trainings in resource-limited settings. These trainings were provided both by the IHV-GLP headquarters team (5 laboratory professionals) and in-country teams (27 laboratory professionals) and, when possible, organized in collaboration with local governments, ministries of health and/or private vendors. These workshops were designed following existing national guidelines and delivered at the district, regional, or zonal level followed by regular quarterly visits by IHV-GLP in-country teams to address specific needs at site level. Based on the observations during site visits and on the quarterly feedback from IHV-GLP in-country teams, a new approach to in-service training was conceived. This approach is presented below.

Challenges

Rowe AK *et al.* analyzed several determinants affecting the performance of health workers (including laboratory professionals) in Sub-Saharan Africa [8]. One key area related to human capacity was the efficiency of previous in-service trainings held in the past by numerous providers. Based on IHV-GLP experience, poor needs assessment and trainees' selection criteria were two major reasons affecting the quality of these trainings. Frequently, training packages were developed and delivered without a full understanding or determination of pre-training knowledge levels. This varied immensely from region to region and was not strictly related to the level of the health facility. Independently of the level of education (certificate, diploma, bachelors), also within the same cadre of laboratory workers, vast differences in knowledge were observed. This was not only due to the type of pre-service curricula and the overall quality of teaching received, but it was dictated by personal interest in specific scientific topics.

Most often senior laboratory staff was selected to attend training sessions solely based on seniority, ignoring consideration of which laboratory personnel would most benefit. This was partly due to the lack of a Professional Development Plan (PDP) and, in most cases, the absence of job descriptions. In addition, senior laboratory staff was generally not directly involved in sample analysis, resulting in low interest on trainings on diagnostic techniques. The reasons for attending trainings were often not scientific, but rather based on personal advantages (days off, per diem, travel, attendance certificates). For example, during a job interview one health worker submitted certificates for a total of 220 days of trainings in one year (2010). This example was not isolated and it reflected the absence of well-structured PDP comprising balanced time for professional activity, continuous medical education and vacation time. In addition, the value of the attendance certificate was commonly overestimated. At best, it attested only to the physical presence at the training sessions, without proving the acquisition of new concepts and skills. This view was commonly accepted and unfortunately the attendance certificate was preferred at the expense of clinical practice. This was partly driven by supervisors adopting the attendance certificate as the only standard for evaluating training retention.

Educational methodology and training format played a key role in retention of training as well. Different approaches targeting non-laboratory health care providers, such as physicians, nurse clinicians, registered nurses, counselors, community health workers, and dentists, achieved good results in training efficacy [9-10]. Training initiatives for laboratory professionals showed encouraging results, but with no evidence of improved results in the daily routine practice [11]. High laboratory

staff turnover and lack of step-down trainings were also very common factors affecting the overall quality of laboratory services.

Skills and policies in human resources management were often non-existent at the health facility level. This gap affected both staff motivation and step-down trainings delivery at the health facility level on a routine basis. Often participants in laboratory trainings refused to transfer knowledge to co-workers for fear of becoming expendable. This conduct was very common and represents a major barrier to translation of training theory into practice at the site level.

The effectiveness of trainings was often assessed by use of the evaluation forms and pre- and post-training questionnaire comparison only. Ciccio' L *et al.* suggested staff retention at the worksite level and their continuous use of acquired skills as indicators for a most valuable training assessment [12]. This approach was more comprehensive, but not suitable for assessing improvements in laboratory operations following a training.

New Approach

To respond to the needs identified in the field and to improve the efficacy of capacity building efforts, the IHV-GLP developed a new approach for in-service laboratory training. This model proposed by the IHV-GLP is illustrated in Figure 1 and aims at improving the quality of laboratory services as a whole.

Pre-training Phase

Needs Assessment – Accurate information of the major gaps is essential for customizing training content. Needs assessment of both laboratory staff and laboratory operations can highlight discrepancies among personal knowledge and day-to-day practice. The main resources for collecting data are specific tools developed by the IHV-GLP team, titled Laboratory Quality Improvement Tools (LQITs). These tools cover several major topics, such as HIV serology, AFB microscopy, malaria microscopy, specimen management, CD4 testing, and waste management among others. Each tool comprises 100 questions covering 12 sections. Some sections cover general aspects, such as safety, Standard Operating Procedures (SOP), forecasting and procurement, and human resources that are common to all the 6 topics. The LQIT's design allows the identification of section-specific gaps for one topic, and also common gaps across different topics. Detailed data analysis provides information both on knowledge of laboratory employees and on quality of day-to-day operations in the laboratory. An example of the use of the information gathered using the AFB Microscopy LQIT in Rwanda is shown in Figure 2.

Selection Criteria of Participants - The selection of training participants must focus more on their duties and

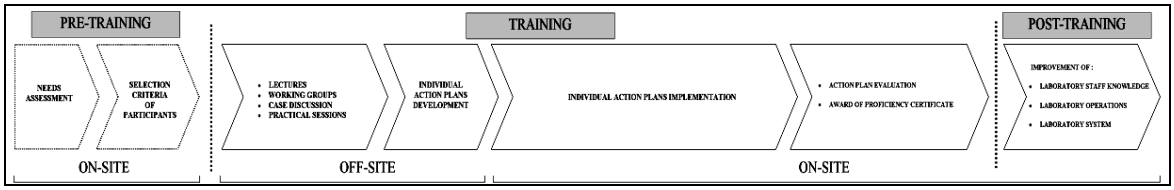

Fig.1 *Different phases of new in-service training approach for laboratory professionals.*

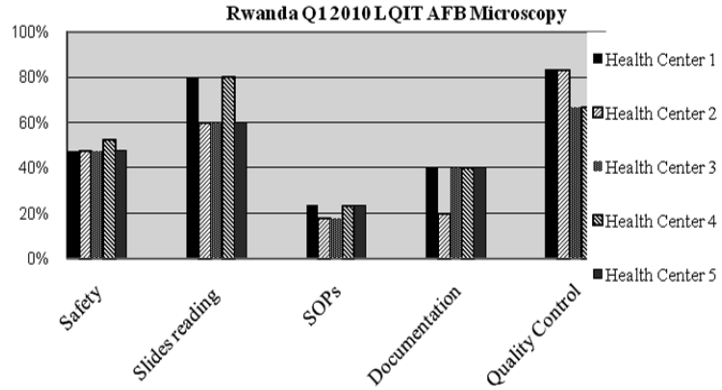

Fig.2 *The scores in different sections of Laboratory Quality Improvement Tool on AFB microscopy of different laboratories in Rwanda.*

job description. Similar profiles of participants and comparable routine tasks result in the improved effectiveness of training programs. This facilitates a participatory approach, generating general discussions and working group sessions in a more stimulating environment. Based on the IHV-GLP field experience, individual motivation is another factor that influences knowledge retention and overall quality of training sessions. Both trainees' background and duties, and their personal interests in the topic of the training are more effective criteria for participants' selection.

Due to the lack of PDPs in many health facilities, fee-paying in-service training represents another valid option for selecting the most appropriate audience. This results in more appropriate selection of participants by health facility management. To maximize the money invested, motivated laboratorians are selected and invited to provide step-down trainings to a broader audience at the health facility level. This approach entails initial investment but can result in PDPs adoption by health facility management and an increase of personnel motivation.

Training Phase

Off-site stage – The structure of the course and the teaching methods adopted affect the final outcomes of the training sessions. Theoretical sessions comprising of long lectures using excessively wordy PowerPoint presentations tend to be ineffective. First, because it is not the teaching method the trainees are used to; and second because most people do not retain more than 20% of the content that is presented in lecture format alone.

The use of less-condensed selectively worded slides and the inclusion of practical photographs portraying local laboratory settings during the training increase participant attention with very effective results.

Covering practical aspects of the theoretical content of the training, appropriately presented, allows for participants to engage in activities. It is highly effective to design activities allowing the participants to share their experiences and learn from each other. Sharing of participant knowledge and experiences, including problem-solving activities and participant presentations keep individuals engaged increasing their knowledge retention. In the authors' experience, guidance leads participants to apply the new concepts in their specific context and improve the retention of training. The practical activities include the development of an action plan for each trainee to accomplish in their own laboratories following the training. Recommended time frame for the action plan is 30 days that, based on the complexity of the topics covered, can be extended up to, but no more than, 90 days. Through the interaction with other participants and under the guidance of the trainers, the trainee is assisted and stimulated to identify objectives and indicators to measure the level of accomplishment. To be effective in this key step it is crucial for trainers to have in-depth knowledge of local laboratories and their most common needs.

The participant, as the person responsible for executing the action plan, presents objectives, related activities, indicators, and strategy in front of the audience as the final step of the off-site stage of the training. This presentation gives trainers the opportunity to evaluate participants' planning skills and their capacity in communicating scientific concepts to peers.

An example of an action plan aimed at introducing Internal Quality Control (IQC) for Ziehl–Neelsen (ZN) staining is illustrated below in Table 1.

Table 1 Example of action plan containing objectives, actions, indicators, and timeframe developed by training participant to be implemented in the laboratory during on-site training stage

Objectives	Actions	Indicators	Timeframe
1. To establish log book for ZN reagents IQC	a. Ask lab manager to order a notebook	a. Notebook ordered and purchased by procurement office	Day 1-3
	b. Draw log book	b. notebook drawn and in place	Day 4
2. To establish SOP for ZN reagents IQC	a. Write SOP for ZN reagents QC	a. SOP approved by lab manager and available	Day 5-7
	b. Train co-workers on ZN reagents QC SOP	b. # of co-workers trained c. SOP understood and approved by co-workers	Day 8
3. To introduce ZN reagents IQC procedure in routine lab operations	a. Develop bench aid on ZN reagents QC	a. bench aid hanged close to AFB smears staining working station b. # of IQC	Day 9-30

On-site stage - This stage offers participants the opportunity to put the lessons learned into practice in their daily setting, and for trainers, different ways to evaluate the training's efficacy. The implementation of the action plan also allows translating training theory into practice by improving laboratory operations. In the case of step-down training provided, use of the same pre- and post-training questionnaire is possible to assess both knowledge retention of secondary trainees, and the skill of communicating scientific concepts of the primary trainee.

At the end of the recommended time frame for implementation, the action plan is evaluated at site level by the trainers using the same indicators presented by the trainee at the off-site stage of the training. The trainee is awarded, in the presence of health facility top management, with a proficiency certificate based on the degree of accomplishment observed by the trainers in the laboratory.

Post-training Phase

To monitor the outputs and to ensure that high level of quality is maintained in the laboratory operations, both LQITs and the questionnaire are used at regular intervals based on need. Both sources of data are important for assessing retention of knowledge over time among laboratory staff and improvements in laboratory operations.

Discussion

This multi-stage approach proposed centers on the awarding of training proficiency certificate to achieve different objectives.

First, to improve laboratory operations related to the topic of the training. The proficiency certificate attests capacity of the participant to contribute to overall laboratory quality improvement through the implementation of the action plan developed at the training. According to the level of proficiency achieved, laboratory managers and health facility administrators evaluate laboratory employees and assess laboratory performance as set by their PDP. But it can also improve recognition from top management that is a key factor in staff turn-around and one of the major reasons for job-dissatisfaction.

Second, it gives laboratorians a sense of responsibility and motivation in their job. Using this approach, trainings represent a way to demonstrate professionalism and commitment.

Third, health facility managers are encouraged to develop PDPs for their laboratory staff and apply these practices to all employees. Developing job descriptions for laboratory personnel allows for specific tasks to be performed and thereby steers an individual towards appropriate trainings when they become available.

Fourth, due to the high staff turnaround of laboratorians, particularly in rural areas, their contribution to the laboratory operations remains active even after their relocation.

Fifth, sharing the action plan at the off-site stage of the training strengthens participant's self-confidence in presenting scientific concepts. This aspect is greatly important to improve two-way communications both within the laboratory (such as step-down trainings), and among laboratory, administrators and medical officers. This communication issue is chronic and it contributes extensively to the lack of recognition of medical laboratory services in Sub-Saharan Africa.

Lastly, the fee-paying in-service training approach can result to be an effective approach in improving both laboratory staff motivation, and so their retention at site level, and the overall management of the health facility on long-term basis.

Way Forward

Improving the efficacy of in-service trainings of laboratory professionals in Sub-Saharan Africa is possible even if challenged by many factors. Some of those are specific to the training approach adopted, while others are related to human resources management policies. From our vast experience in Sub-Saharan Africa, detailed needs assessment, targeted selection of training participants and motivated trainees are crucial for the effective training of laboratory staff. In the authors' view the approach illustrated has the requisites to overcome the challenges in transferring theoretical knowledge from single trainee to practical skills at laboratory level. For long-term retention of knowledge and for laboratory staff motivation, there is urgent need for strategies at health facility management level that include clear job descriptions, but also salary adjustment policies, benefits (e.g fees for in-service training) and professional development plans.

The numerous efforts in strengthening the laboratory systems in Sub-Saharan Africa can be successful only if an effective training approach is adopted and ingrained into a broader strategy for human resource management at the facility level.

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